



# THE NAVAJO NATION

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November 20, 1990

Mr. Robert Bornstein, On-Scene Coordinator  
Emergency Response Section  
U.S. EPA - Region IX  
75 Hawthorne Street  
San Francisco, CA 94105

Dear Mr. Bornstein:

As requested, attached is information on the Haystack geology and below is information on possible Navajo-based contractors.

The paper on the Haystack area geology is self-explaining.

For earth moving, there is the Navajo Engineering & Construction Authority (NECA). No one in NECA has the 40-hr health and safety training but some have training working on DOE's Uranium Mill Tailings Reclamation Act project at Mexican Hat, UT. NECA is at:

Navajo Engineering & Construction Authority  
P.O. Box 969  
Shiprock, NM 87420  
(505) 368-5151  
Contact: Jonathon James, Chief Estimator

For fencing needs, two Navajo-based firms were identified:

All Indian Fence Company, Inc.  
P.O. Box 2266  
Window Rock, AZ 86515  
(602) 871-2450  
Contact: Ronald E. Prows

BlueEyes Fencing Company  
P.O. Box 3592  
Shiprock, NM 87420  
(505) 598-9619  
Contact: Perry BlueEyes

If you have any questions, please contact me at (602) 871-7331.

Sincerely,

Patrick Antonio, Hydrogeologist  
Navajo Superfund Program

xc: JoAnne Manygoats, Director, Navajo Superfund Program



## GEOLOGY OF THE HAYSTACK STUDY AREA

### Introduction

Paddy Martinez, a Navajo Indian prospector, is responsible for the discovery that was to develop into the most prolific uranium-producing district in the world. Although his discovery was made in 1950, uranium minerals that were known to occur near Grants had been recognized in the early twenties and mapped on the outcrop in 1948. The minerals were given very limited little consideration at the time because of their oddity and their apparently limited volume and association with a limestone in 1948.

Martinez's tyuyamunite discovery was from a Todilto Limestone outcrop in sec. 19, T13N, R10W at the base of Haystack Butte on property owned by the Santa Fe Pacific Railway Company. Uranium has since been found in commercially important quantities in the Dakota Sandstone and in the Brushy Basin Shale and Westwater Canyon Members of the Morrison Formation.

The presence of fluorite and barite together with abundant nearby volcanic activity suggested to some a hydrothermal source. Others believed that the uranium was leached from volcanic debris in the Brushy Basin Shale and redeposited in the Todilto.

Exploration and discovery of ore bodies in the Todilto continued in spite of the more glamorous discoveries in the Morrison Formation.

### Geologic Setting

The Haystack area is in the Grants mineral belt which is flanked on the north-northeast by the San Juan Basin, on the east by the Rio Grande trough, and on the south and west by the Acoma Sag and the Zuni Uplift. From the top of Haystack Butte to the bottom of the deepest area well, the sedimentary rocks encountered range in age from lower Cretaceous to Permian. Associated intrusive and extrusive rocks of the Mount Taylor and Zuni volcanic fields are of Tertiary and Quaternary ages. Regional dip of the sedimentary rocks is generally northward toward the San Juan Basin. The regional attitude is modified locally by normal faults and minor folds.

### Ground Water

For the Haystack study area, the principal aquifers encountered, in ascending order, are the Sonsela Sandstone Bed/Middle Chinle unit of Triassic age, the Entrada Sandstone of Jurassic age, and the Summerville Formation of Jurassic age. The Summerville Formation does not normally exist as an aquifer which may be the reason why the well drilled into the Summerville Formation is currently inactive. Regional ground water flow is generally to north into the San Juan Basin. Although some faulting and folding exist in the area, it is not known if these features significantly influence local ground water movement.

# Stratigraphic Column

Formation (Age)	Thickness (Feet)	Description
Dakota Sandstone (SS) (Cretaceous)	5-150	Tan to gray, medium-grained quartz SS and conglomeratic SS with some interbedded carbonaceous shale and local coal lenses. Caps Haystack Butte.
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Morrison Formation (Jurassic)	200-600	
Brushy Basin Member		Greenish-gray mudstone and siltstone with local thick arkosic SS units. Likely undifferentiated from Westwater Canyon Member at study area.
Westwater Canyon Member		Yellowish-gray, poorly sorted, arkosic SS and some interbedded gray mudstone. Intertongues with Brushy Basin Member.
Recapture Member		Alternating beds of gray SS and grayish-red siltstone or mudstone. Contact with Cow Springs SS sharp but intertongues with Westwater Canyon Member.
Cow Springs SS (Jurassic)	0-350	Pale-red to pale-brown, fine- to medium-grained SS. Forms massive cliffs. Upper part has thick sets of large-scale crossbeds; lower part grades down into smaller-scale sets of crossbeds and some flat beds.
Summerville Formation (Jurassic)	20-200	Alternating beds of pale-brown, thin-bedded SS and reddish-brown mudstone or siltstone. SS beds thicker in upper part grading into overlying Cow Springs SS; base grades and intertongues with the Todilto Limestone. Area aquifer sourced well 16B-38.
Todilto Limestone (Jurassic)	0-100	Upper part (0-75 ft) is gypsum-anhydrite member. Lower limestone part is gray, laminated toward base and more massive; contains interbedded siltstone. Formation bearing the uranium ore of the Haystack mines under study.

Entrada SS (Jurassic)	50-300	Upper part is reddish-orange, fine-grained SS with thick sets of large-scale crossbeds and a medial unit (10-85 ft) of red and gray siltstone probably conformable on Wingate SS. Lower SS unit may belong in Entrada SS or may be the Wingate SS. Area aquifer sources well 16T-521.
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Wingate SS (Jurassic/ Triassic??)	50-200	Reddish-brown, fine-grained cross-bedded SS.
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Chinle Formation (Triassic)	700-1500	
Owl Rock Member		Mottled light-gray and grayish-pink interbedded limestone and calcareous siltstone.
Sonsela SS Bed		Light-gray SS and conglomerate. Area aquifer sources wells 16T-551 and 16T-552.
Monitor Butte Member		Siltstone, SS, and limestone conglomerate.

Shinarump Conglomerate (Triassic)	0-200	Light-gray to yellowish-gray SS and conglomerate.
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San Andres Limestone (Permian)	0-200	Grayish-orange-pink to light-brown limestone with some siltstone.
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Glorieta SS (Permian)	0-275	Chiefly SS. Hydraulically combined with the San Andres LS, the areas most productive aquifer.
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# SAN JUAN BASIN TIME-STRATIGRAPHIC NOMENCLATURE CHART

